

A SECURE SYSTEM FOR ELECTRONIC VOTING

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CROSS REFERENCE TO RELATED PATENT APPLICATIONS

5 The present application is a continuation-in-part of co-pending parent application Serial
10 No. 09/597,607, filed 06/20/2000, which is continuation of application Serial No. 09/642,872, filed
08/21/2000, now US Patent No. 6,480,587, issued 11/12/2002, which is a continuation of
application Serial No. 09/281,739, filed June 4, 1999, now US Patent No. 6,169,789, issued
January 2, 2001, which is a continuation-in-part application of a now abandoned application
entitled A SYSTEM LEVEL SCHEME TO CONTROL INTELLIGENT APPLIANCES, Serial
15 No. 08/764,903 filed December 16, 1996, now abandoned.

BACKGROUND OF THE INVENTION

In the prior art the citizen of a country faces many daunting obstacles in exercising the right
to vote in the local, state or national elections. The prior art system generally requires that the
20 individual citizen be physically present at the polling station and exercise the right to cast the
ballot in the confines of the voting booth.

In recent times, the ability to cast the vote by choosing the absentee ballot method is being
made more available for a number of reasons that include reduced cost to the county and fewer and
fewer polling workers and places being available each year in a proximate location to the voter.
25 However, the absentee ballot method requires that the election authorities prepare and send the
ballots by postal means early enough for the citizen to receive the ballot. The absentee ballot
method further imposes an undesirable constraint on the voter by requiring that the ballot must be

physically returned by the postal means to the county registrar before the polls close, which generally means at the end of the normal final delivery time of the polling day.

30 The prior art absentee ballot method thus imposes an additional and undesirable requirement on the voter who chooses this method of voting, requiring the voter to select and cast the vote well in advance as compared to other citizens who physically vote at the polling station and are thus able to make their choice at the very last minute. It is imperative that the latest and best information is available to the voter at all times for the voter to make an informed choice. In a
35 dynamically changing world, the fame, fortune, the positions on the issues and general information about the candidate is fast changing and so are the world events. Hence, there is an acute need to enable a system that allows the voter to cast the vote in a timely manner of the voters choosing, during the approved balloting window as determined by the election authorities. Additionally, disabilities, infirmities, time off from work, transportation and other constraints prevent the voter
40 from easily exercising the inherent right to vote enshrined in a vibrant democracy.

 In addition, there is another distinct difference between the absentee ballot method and the methods used for casting the vote at a polling station in the voting booth. The voting systems used in the voting booth are machine based whereas the absentee ballots are punch card based. There is a transition underway to touch screen enabled voting machines as the punch card method is now
45 considered as error prone due to hanging chads and other limitations that are quite well known after the US presidential elections of the year 2000. The number of absentee ballots being cast is significantly high and moving higher every election period. Consequently the absentee ballots represent the margin for victory or defeat. Yet, as stated in here the inability of the absentee voter to exercise the right to vote at the desired time and the related lack of timely information further
50 coupled with the differences in the methods of the actual ballots makes the entire voting process error prone and shakes the very foundations of democratic choice and governance irrespective of the voters party affiliation.

 In the prior art the voters speak and read different languages. The election authorities are required to print and provide voting information and ballots in a plurality of languages at

55 considerable expense. In addition, the voters that speak minority languages are often intimidated by the process and tend to participate in the voting in elections at a lower participation level.

In addition, the level of participation in most elections is far less than desirable.

Consequently, the outcome of some elections may be determined by very few voters with the absentee votes being a significant factor in the election outcome. Yet, for a democratic system to

60 reflect the views of the electorate, a significant majority of the eligible voters must participate and exercise their vote in a fully informed manner with convenience and relative ease.

The prior art touch screen enabled fixed in place voting machines are a definite improvement over punch cards but do not address the issues highlighted above, especially the mobility issue. In addition the touch screen enabled voting machines of the prior art are not
65 directly connected to the servers nor are they operating in real time. It is therefore anachronistic, that as we move very fast into a highly connected digital world, the very means of exercising our right to vote is constrained by methods and systems that do not keep pace, are antiquated and prone to error and legal challenges. In addition, the special recall elections enable the participation of a very large number of candidates on the ballot leading to confusion and the difficulty of
70 selecting the candidate desired by the voter.

The prior art relies on voting machines that have removable memory cards and a built in hard drive and a means for activation of the voting machine by use of an activation card issued to the voter by the polling personnel. The memory cards are collected by the election officials and inserted into computers that then read the data from the cards. In the prior art the votes/voting data
75 then is hand delivered to the county election office or the data subsequently transmitted over a telephone line. In the event a recount is requested the county officials recount the data from the memory cards. In the event a hand count is requested, the county election officials take a print out and calculate by hand from these print outs. Consequently this archaic and elaborate process is fraught with the potential for errors and even fraud. As an example the level of redundancy to the
80 memory card is only the hard drive in that particular voting machine. This is only a low level of redundancy and fraud protection. In addition in the prior art the voter is not enabled to receive a print out of the way the votes were cast which is a limitation. Therefore the present invention

addresses a real world problem that requires a solution and solves the problem by novel means by fully leveraging the power/databases of the mobile devices, the availability of wired or wireless connectivity and the power/databases of the trusted escrow servers.

The present invention in a unique and novel manner discloses the methods for solving these enumerated problems of the prior art and enabling the highly mobile electorate to cast the ballots in a manner that levels the playing field while enhancing the security and integrity of the election process utilizing one or more types of touch screen enabled mobile devices. The present invention also enables the casting of votes in commercial applications using mobile devices such as voting on various proxy matters of a company and other applications.

SUMMARY OF THE INVENTION

It is an object of the present invention to enable electronic voting and related operations by the use of one or more types of mobile devices that are configured with keyboard and or touch screen input/output and display capabilities.

It is an object of the present invention to enable electronic voting by the use of one or more types of mobile devices having communication, computation and control features; and said mobile devices being further configured with keyboard and or touch screen input/output capabilities.

It is an object of the present invention to enable electronic voting by the use of one or more types of mobile devices having communication, computation and control features; and said mobile devices being further configured with standard, partial or special function keyboard, and or touch screen input/output capabilities and or voice/audio input/output capabilities.

It is an object of the present invention to enable electronic voting and other functions by means of the mobile device operating in a stand alone manner and or in conjunction with a local, central or network sever.

It is an object of the present invention to provide timely information on the mobile device by touch screen method, text method, video method, photographic method, image method, graphics method, data method, voice method and audio method relating to the candidates, candidate profiles, issues, positions and other relevant matters.

It is an object of the present invention to enable multiple windows in a touch screen enabled display window for easy navigation back and forth for intelligent and informed voting.

It is an object of the present invention to enable language translation of various types of data and information and further enable of the means for input and output by one or more methods
115 in one or more languages.

It is an object of the present invention to enable language translation for electronic voting and other functions by means of the mobile device operating in a stand alone manner and or in conjunction with a local, central or network sever.

It is an object of the present invention to enable electronic voting and other actions by one
120 or more input/output methods inclusive of standard keyboard, full function or partial keyboard, macro functions, touch screen, voice, sound, audio function means of the mobile device operating in a stand alone manner and or in conjunction with a local, central or network sever.

It is an object of the present invention to enable electronic voting by hearing impaired, vision impaired and other disabled voters by enabling one or more input/output methods as desired
125 by the user, inclusive of standard keyboard, full function or partial keyboard, macro functions, touch screen, voice, sound, audio function means, said functions being configured on the mobile device operating in a stand alone manner and or in conjunction with a local, central or network sever.

It is an object of the present invention to enable the voters who do not know how to read
130 and write, as is the case in a number of developing countries, to exercise the right to vote by symbols, icons, figures, and other visual indicators that are more readily recognizable by the voter as representing a specific candidate or ballot measure.

It is an object of the present invention to enable access by the voter to the candidate's profile, photos, video and other information in a contemporaneous manner on the mobile device
135 such that the voter is capable of comparing the different candidates and different issues before casting the vote.

It is an object of the present invention to enable authentication of the voter by the local, central and or network server by one or means inclusive of photo, driver's license, passport, social

140 security or similar identification cards, video, audio, voice print, finger print, retinal print, digital signature, handwriting recognition, signature recognition, the unique mobile device identification number and other similar means not enumerated herein.

145 It is an object of the present invention to enable authentication of the voter's unique identifying attributes by comparison with various lookup tables/databases resident on the mobile device itself and or in conjunction with the lookup tables/databases resident on the local, central and or network servers.

It is an object of the present invention to utilize the high speed wired or wireless communication capabilities of the mobile device and the servers for encrypted and secure connectivity using various mobile device identification methods such as IPv6 and other methods.

150 It is an object of the present invention to leverage and effectively use the tremendous processing power of the mobile device by itself and or in conjunction with the local, central and or network servers, said servers having one or more levels of trust and being maintained by designated election authorities, to execute the authentication, encryption, security, secure high speed communication, secure communication at other speeds, and other enabling features of mobile electronic voting.

155 It is an object of the present invention to enable a unique electronic key to be assigned by the central trusted server to the voter/mobile device, said server being under the control of un impeachable and trusted election organizations which are further monitored by non partisan organizations and boards.

160 It is an object of the present invention to validate the electronic key based on the voter profile only and or the voter in conjunction with the unique identity of the mobile device owned by the user.

It is an object of the present invention to time stamp the voting action by the voter in conjunction with the mobile device and or the servers.

165 It is an object of the present invention to enable the capture and storage of the actual manner in which the voter cast the votes, frame by frame or a summary of the frames, on the mobile device storage.

It is an object of the present invention to enable for the real time provision of a validated electronic receipt which includes the actual voter selections and time stamp, such validation being executed by the trusted election server and provided to the voter/mobile device.

170 It is an object of the present invention to preclude voting multiple times by the same voter by authenticating the specific voter by finger print, voice print, retinal print or other means and keeping track of the real time actions of the voter in a database that is maintained on a trusted server and updated in real time.

175 It is an object of the present invention to location stamp the voting action by the voter in conjunction with the mobile device and or the servers and GPS servers.

It is an object of the present invention to enable voting by handicapped individuals with the assistance of an approved and or trusted individual whose identity, signatures and relevant data is recorded by the central election server via the mobile device touch screen or other interface.

180 It is an object of the present invention to provide full and complete election results immediately after the polls close by leveraging the real time computational capabilities of the servers under the control of the election body.

185 It is an object of the present invention to enable the time-locking of the servers, said time lock beginning at a prescribed time and ending at a set time, to ensure that unauthorized and premature access to the polling data and results is precluded and to avoid premature release of the polling information before the polls officially close.

It is an object of the present invention to provide for a means for over riding the time lock with the authentication and permission of trusted and neutral parties in the extreme event of an emergency that warrants the override feature.

190 It is an object of the present invention to provide for a time-lock and or function-lock on the election servers to ensure that unauthorized access and other intrusive functions are not permitted during the duration of the designated period.

It is an object of the present invention to provide if needed a hierarchy of servers that are under the control of local, state or national election authorities to meet the needs of the local, state and federal laws.

195 It is an object of the present invention to maintain a redundant servers and storage as appropriate at the same or different locations for fail safe purposes.

 It is an object of the present invention to enable the data to be periodically swept and stored in multiple secure locations to ensure real time redundancy and security.

 It is an object of the invention to maintain valid voter rolls based on eligibility on a secure
200 central server or servers and enable the dynamic validation of the request to cast the ballot by the voter.

 It is an object of the present invention to create an improved fixed in place touch screen enabled voting machine such that the voters have the option of going to the polling place and casting their votes or using the touch screen enabled mobile device to cast their votes.

205 It is an object of the present invention to enable military service personnel and other citizens that are outside the country or a designated geographical area to participate in the elections in the event the laws permit the participation by the voter by using the mobile device.

 It is an object of the present invention to enable students and other transient individuals to participate in the elections using the mobile device.

210 It is an object of the present invention to enable the mobile device to be configured for one or more types of communication protocols such that the mobile device conforms to the desired communication protocols and parameters defined by the election authorities.

 It is an object of the present invention that a single mobile device is capable of various communication, computation and control applications and is further enabled for electronic voting
215 at the desired time and for the desired elections.

 It is an object of the present invention to enable other types of voting such as for corporate proxy voting and for other voting applications by means of a mobile device.

 It is an object of the present invention to enable auctions and bidding by means of the mobile device by itself and or in conjunction with a local, central and or network server utilizing
220 the processing power of the mobile device by itself and or in conjunction with a local, central and or network server.

It is an object of the present invention to enable the stationary devices configured with touch screens, mobile devices configured with touch screens and intelligent touch screen enabled voting machines located at the polling station to be used in a uniform and identical manner to meet the requirements of the election authorities by communicating with the trusted servers of the election authorities by wired or wireless means while protecting the confidentiality of the ballot.

It is an object of the present invention to enable opinion surveys and other polls by using the processing power of the mobile device by itself and or in conjunction with the local, central and or network server.

Other objects, features and advantages of the present invention will become apparent from the following detailed description when taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING

The accompanying drawings, being incorporated in and forming a part of this specification, illustrate embodiments of the invention and, together with the description, serve to explain the principles of the present invention:

FIG. 1 shows a fixed in place stand alone touch screen enabled Prior Voting Machine, PVM, of the prior art that is not networked nor enabled with intelligence.

FIG. 2 is an embodiment of the present invention showing a touch screen enabled Intelligent Voting Machine, IVM, of the present invention that is networked with a local server, central and or network server.

FIG. 3 is an embodiment of the present invention showing a touch screen enabled mobile device dynamically configured as a Mobile Voting Machine, MVM, forming a part of a wired or wireless network on which local, central and or network servers/storage exist.

FIG. 4 is an embodiment of the present invention showing a means for redundant and secure servers/storage located locally and or in one or more remote locations, said servers/storage being connected by wired or wireless methods for secure communication; and working in conjunction with the Escrow Server, Trusted Servers, Intelligent Voting Machines, IVM and Mobile Voting Machines, MVM units over public and private networks.

250 FIG. 5 is an embodiment of the present invention showing a means for voters who have acceptable vision but who do not know how to read and or write, to exercise their voting privileges by means of symbols and images and photos that represent the different candidates and the different issues.

FIG. 6 is an embodiment of the present invention showing a means for voice input/output
255 in one or more languages to enable language impaired voters to cast their votes. Additionally includes a trusted time keeping server and a trusted GPS server for location determination of the mobile voter.

DETAILED DESCRIPTION OF THE INVENTION

260 The present invention provides a means wherein the Intelligent Voting Machine, hereafter referred to as IVM for the sake of brevity, is enabled with a number of intelligent features such as a touch screen enabled screen for input and output and the ability to be connected to trusted servers at the local precinct level, the county level and the state level by secure wired or wireless means.

The present invention additionally provides a means for configuring the intelligent voting
265 machine, IVM, with features such as a microphone and speaker for voice and sound input/output for utility for the vision impaired or language impaired voters.

The present invention provides a means for configuring the intelligent voting machine, IVM, with Braille enabled keyboard for utility to the vision impaired voters.

The present invention provides a means for configuring the touch screen input with symbol
270 driven selection method for utility to the reading and writing impaired voters.

The present invention enables the standard touch screen enabled mobile communication device to be configured as a Mobile Voting Machine, here after referred to as the MVM for the sake of brevity. The present invention provides a means for wired or wireless communication by the mobile communication device with trusted servers.

275 The present invention provides a means for dynamic configuration of the standard touch screen enabled mobile communication device as a MVM with a number of features such as language translation for use by language impaired voters, voting by symbols for reading/writing

impaired voters, voting by sound, voice and audio for vision impaired voters and voting by a Braille special keyboard for vision impaired voters.

280 The present invention generally enables secure and convenient means of voting and provides numerous advantages to the voters by providing a means for voting by the mobile communication device configured as a MVM or alternately the ability to use an intelligent voting machine, IVM located at the polling station.

285 The present invention enables the stationary devices configured with touch screens, mobile devices configured with touch screens and intelligent touch screen enabled voting machines located at the polling station to be used in a uniform and identical manner to meet the requirements of the election authorities, by communicating by wired or wireless means with the trusted servers maintained by the election authorities.

290 The present invention provides a means for leveraging the built in processing power of the IVM and the MVM in a stand alone manner and or in conjunction with various levels of trusted servers to provide the desired functionality, utility, security and convenience to the voter.

 These features and other novel features are described in detail to further illustrate and explain with reference to the appended figures.

295 Referring now to Fig.1 in detail, the touch screen enabled voting machine of the prior art is illustrated to show/contrast and further teach the unique distinguishing features of the present invention. The voting machine of the prior art 100, consists of a touch screen 101 for input/output and display, a hard disk drive 102 for storage of the votes cast on that particular machine, a removable magnetic/memory storage card 103 for storage of the votes cast on that particular voting machine and a card reader 104 for activation of the voting machine.

300 It is readily apparent that the voting machine of the prior art does not enable the voter to receive a print out of the manner in which the voter has cast the votes nor does it provide a receipt. With this limitation the voter is unsure if the specific votes that are cast by the voter on one or more line items and or in total have been recorded properly. This is a very dissatisfying experience and presents potentially for errors and fraud. Additionally the hard disk drive, 102 has no
305 redundancy and should the hard disk drive crash the votes already cast on that voting machine may

not be retrievable for ever and or in counted in time for inclusion in the official results. The memory storage card, 103 is further used in reading the votes recorded on it by means of insertion into a separate computer. The memory card 102 has the potential of being damaged, lost or fraudulently switched presenting a potential security flaw since many memory cards have to be
310 handled at the election time. While the hard drive and memory card are redundant and contain the same information, this level of redundancy is not adequate. The voting machine is activated by the voter by means of an activation card, 104 issued by the polling workers to the voter at the time of voting at a polling station. The voting machine of the prior art does not comprise of a microphone and speakers for voice and audio input/output. In addition, the voting machine of the prior art is
315 not connected to a trusted local, central or network server by wired or wireless methods for communication, computation, control and the accessing of various databases. The foregoing illustrates some of the prior art limitations of the voting machine and there are additional limitations not described in here.

Referring now to Fig.2, the intelligent voting machine, IVM, 200 of the present invention
320 comprises of a touch screen 201, for input/output and display, a hard disk drive 202 for storage of voting data within the voting machine, a removable magnetic/memory card, 203 for storage of voting data that is subsequently read by a separate computer, an activation card reader 204, for enabling the voter to activate the voting machine by a card issued to the voter at the polling station and a printer 210 that is either built in to the voting machine or is external to the voting machine
325 for the purpose of providing a real time print out of the actual manner in which the voters has cast the votes and or for providing a valid receipt to the voter. The connection between the printer and the voting machine in the case wherein the printer is located external to the voting machine is by wired or wireless communication path, 211. In addition, the present invention provides a secure wired or wireless communication path 250, wherein the intelligent voting machine, IVM is able to
330 interact with various levels of secure and trusted servers. As an example, the trusted local server 220 with its associated storage 221 may be located at the precinct level or other locations, the trusted central server, 230 with its associated storage 231 may be located at the county level and the network server, 240 with its associated storage 241 may be located at the state level. The

elections generally are the responsibilities of the state and directly not that of the federal

335 government. Consequently, another layer of trusted servers at the national level is not shown.
However, any number of levels of trusted servers may be deployed said servers being connected to
each other in a layered manner and or in parallel with ultimately each voting machine being
connected to a server either directly or indirectly with appropriate firewalls gating the access. The
intelligent voting machine, IVM, of the present invention is enabled to have a built in processor or
340 no processor built in, with the ability to leverage the processing power of the built in processor by
itself and or in conjunction with the processing power of the trusted local, central and network
server to provide the desired and election authority approved functionality for enhanced utility to
the voter.

Example 2.1: The IVM provides means for real time capture of one or more frames
345 displayed on the touch screen, said frames representing the voter's final choices. The means for
recording the frames may be by screen capture method, digitizing and or other methods. The voter
is prompted by display or other methods that the data is being recorded as final and further
prompted to receive a printout if desired. Since the printer is co-located in the voting booth, the
voter is the only one that obtains the print out. To preclude the print out being left inadvertently in
350 the printer with the potential for the print out of one voter being seen by the next voter, an audible
alert is sounded by the printer within a set time interval and or upon the failure to remove the print
out from the printer. Optionally, upon the failure to remove the print out by the voter within the
designated time window, the printer is configured to advance the print out through a module that is
part of the printer said module being capable of destroying the print out by shredding, erasing or
355 other means. The present invention enables anonymity and at the same time provides a valid
record of the voting to the voter in real time.

Example 2.2: The IVM of the present invention is connected to various trusted servers at
the precinct level, county level and the state level by secure high speed wired or wireless means to
provide redundancy of the storage of the valuable voting data and consequently, this system is not
360 just dependent on the hard drive or the removable memory card associated with the particular
voting machine. The tabulation of the results is in real time enabling the results to be announced

very soon after the polls officially close. In the event of election challenges, there are a number of redundant sources of valid data that may be accessed in real time, such that speculation and doubts about the integrity of the election process are quickly put to rest. Timing is of the essence in elections and the present intelligent voting machine, IVM enables delayed or real time tabulation and announcement of the results.

Referring now to Fig.3, the mobile communication device such as a cordless telephone, cellular telephone, Intelligent Protocol based IP phone, Wi-Fi phone, PDA and other multi function communication, computation and control devices are enabled in the present invention, to be configured as a mobile voting machine, MVM of the present invention. Alternately, the MVM is a standalone mobile voting machine designed specifically for executing electronic voting. The reference to MVM in the present invention is intended to include both the mobile device that is dynamically and temporarily configured for electronic voting and or a dedicated device designed specifically for mobile electronic voting purposes. The mobile device, acting as a MVM, is preferably touch screen input/output/display enabled for conforming to the official election body approved functions of an intelligent voting machine such that in this mode the mobile device emulates the approved and desired functions of an electronic voting machine. In certain cases the mobile device that is not touch screen enabled may with regulatory approval emulate the desired function of the electronic voting machine, by keyboard, voice or other input/output methods executed on the mobile device.

The present invention by extension and by inference extends to stationary devices or stationary voting machines, SVM, such as a personal computer but not limited to, the implementation of the desired and enabling features of the present invention with specific reference to the intelligent voting machine, IVM and the mobile voting machine, MVM for the purposes of electronic voting and other applications using the device by itself and or in conjunction with one or more trusted servers, escrow servers connected to the device by wired or wireless means. The examples with reference to an MVM generally extend to the SVM and are easily executable by those knowledgeable in the art on an SVM and are intended in this disclosure to be inclusive to the SVM.

390 With further reference to Fig. 3, the mobile communication device/mobile voting machine, MVM is represented by 300, the touch screen of the MVM is represented by 302 and the keyboard is represented by 301. The trusted local server 320 and its associated storage 321, the trusted central server 330 and its associated storage 331, the trusted network server 340 and its associated storage 341 are connected to the MVM 300 by the wired or wireless communication path 310. The 395 trusted local, central and network server are connected to each other in a desired level of connectivity with the connection paths being isolated and not accessible by the mobile device/mobile voting machine 300. The intention is to isolate the communication path 310 from the internally secure path 320 for security reasons.

Example 3.1: The mobile device is dynamically transformed from standard 400 communication, computation and control uses to the mobile voting machine, MVM configuration by utilizing the processing power of the mobile device by itself and or in conjunction with the processing power resident on one or more of the trusted servers which are accessed by wired or wireless means.

Example 3.2: The touch screen enabled mobile device is dynamically configured to 405 emulate the functions of the approved electronic voting machine protocols by down loading the approved application related functional instructions from the trusted servers maintained by the election body which are made available upon registration and approval by the election commission and or the secretary of state or other approved agencies.

Example 3.3: The registered MVM 300, is enabled to access the voting information from 410 the trusted election servers, 320, 330 and 340 and only upon valid personal registration during the approved time window, log-in and authentication upon log-in by the trusted servers by using one or more authentication schemes such as voter registration card number based, drivers license based, finger print based and other methods based. Voting information is made available during the approved voting period to ensure that the MVM is current on a real time basis.

415 Example 3.4: The registered voter is enabled in some cases to designate the specific mobile device intended to be configured or configured as a MVM. This feature of device based identity coupled with personal based identity enables an additional of authentication by the voter and the

election authorities. The use of an additional level of device authentication in conjunction with the personal registration may be required or made optional to ensure secure voting by the registered voter and decrease the element of fraud and casting multiple votes. The mobile device identification is enabled to be static or dynamic IP based, Internet Protocol based identification using IPv4 or IPv6 methods, phone number based, and or other mobile device system identification based as deemed appropriate by the user and or the election authorities.

Example 3.5: The mobile device and or the voter as an individual are approved and enabled by the trusted servers to exercise the vote during the designated time frame as an absentee voter if the voter desires to do so and locked out from access to the trusted election servers before or after the designated time window.

Example 3.6: The voter as an individual using the approved mobile device, MVM are enabled to exercise the ability to vote on the designated election day by means of the mobile electronic voting method, beginning at the exact designated time when the polls open and precisely ending at the exact designated time when the polls close to enable the mobile electronic voting to be synchronized with the regular physical voting at a polling station. Any attempt to vote outside this window results in a lock out event requiring a reset by the trusted election servers.

Referring now to Fig.4, the intelligent voting machine, IVM located at the polling stations is represented by 400 and the touch screen of the IVM by 410. The mobile device configured as a mobile voting machine, MVM is designated by 420, the MVM touch screen is designated by 421 and the keyboard of the MVM is shown as 422, and the wired or wireless communication path between the MVM 400 and the various trusted servers and their associated storage 430/431, 440/441 and 450/451 is shown by 425. The wired or wireless communication path between the IVM 400 and the trusted local server 430, the central server 440 and the networked server 450 and the associated storage of said servers, 431, 441 and 451 is shown by 415.

Example 4.1: Means for achieving layered security and isolation of servers.

Additionally, the trusted servers and their associated storage devices 430/431, 440/441 and 450/451 are connected by wired or wireless means to various levels of remotely located and secure servers and their associated storage and the storage databases, 460/461, 470/471, 480/481 and also

to the escrow server 490 and its storage 491 by one or more secure and dedicated high speed communication lines shown by 491. The remotely located servers 460, 470 and 480 are enabled to be connected to the remote servers and the escrow server by the secure dedicated line 491 whereas the communication path between the servers 430, 440 and 450 is by the secure communication path 490. Neither, the communication path 490 or the communication path 491 can be accessed by the IVM 400 or the MVM 420 or by any other unauthorized individuals, entities or communication devices. The trusted servers 430, 440 and 450 are enabled for access by the MVM by communication path 425. Further the election body may limit the access to the servers 430, 440 and 450 singly or in combination and maintain another level of corresponding proxy servers that may be accessed by outside mobile voting machines or inside intelligent voting machines. Any access to these real servers or the corresponding proxy servers 430, 440 and 450 is enabled by means of an approved communication device that is specifically configured as a MVM, such access and authorization, the timing and duration of the access determined by security considerations to achieve layered security and isolation of one or more of the servers, said security and access protocols solely determined by the election authorities.

Example 4.2: An additional level of security and real time redundancy is achieved by means of the IVM that is network connected to one or more trusted servers wherein the data on the IVM is swept real time to one or more trusted servers and the storage that is associated with said trusted servers. In the prior art the redundancy level is very low and at best the redundancy resides in the hard drive of the voting machine and the memory card with the potential for the loss of data during a short or long period due to acts of nature such as fires, floods, earthquakes, terrorist attacks and other catastrophic events. The potential for an unforeseen disastrous event is acute in the world today and the probability of an event happening during the election period at one or more locations is not trivial statistically. In the event of such a terrible and tragic event the final results of an election could be skewed in an undesirable and unforeseen manner. Therefore the homeland and other security considerations warrant the real time and dynamic capture of the polling data from every location with the periodicity/frequency of the data sweep from the individual IVM units and the servers being determined by cost, data integrity and security

considerations. The present invention enables the means for periodic data sweep from an
475 individual IVM unit or a group of IVM units located at a polling station to a trusted local server;
and the periodic data sweep from the trusted and secure local server to a trusted and secure central
server, and the periodic data sweep from the central server to a trusted and secure network server.
The data sweep and storage of the valuable data in appropriate databases in the storage devices
associated with the trusted servers is enabled to be executed sequentially or in parallel to the
480 desired servers/storage, located in one or more geographical locations such as at remote and
trusted servers and storage devices 460/461, 470/471, 480/481 and the escrow server 490/491; and
over one or more of the desired and secure communication lines either in a sequentially manner or
in parallel manner, at the desired time or in the desired time window and or in a random manner,
and at the desired periodicity/sweep frequency using the best available encryption algorithms and
485 data compression technologies.

Example 4.3: The Escrow server, 490 and the associated storage device 491 are updated
with polling data from all the distributed IVM machines and the mobile voting machines, MVM
units on a real time basis and are in the control of the election commission with a high level of
access control under the watchful purview of the judiciary and the public as needed. The data is
490 time stamped. The escrow server is intended to perform the function of an information repository
that is un-impeachable for its integrity and accuracy.

Referring now to Fig. 5, in another embodiment of the present invention the electronic
voting by illiterate voters who are reading and writing impaired is enabled by providing a means
for symbol driven selection of the different candidates and different issues. Symbols are readily
495 recognizable and represent an efficient means of selection. In a number of developing countries the
literacy rate is very low while the intelligence of the electorate is very high. The voters are well
informed and capable of making independent assessments on the candidates and issues.
Consequently, of the most efficient methods is to enable symbol driven voting.

The IVM of the present invention is represented by 510, with the IVM having a touch
500 screen enabled input/output capability 514. In the touch screen window a choice is provided to the
voter for selecting the symbol driven election method by symbol, voice or audible prompt. Upon

selection of the symbol driven voting method, the touch screen of the IVM is enabled for display of the various candidates and the different issues with each candidate and each issue being uniquely represented by an associated symbol. As an example, the row 511 represents the candidates and the issues in some defined order that require a choice. The row 512 represents the action representing YES choice and the row 513 represents the NO choice. The selections are executed by touching the appropriate actions associated with each symbol and selecting the symbol associated with the YES action and the symbol associated with the NO action. The foregoing is a representation for illustration purposes of a simple symbol driven method and is not intended to be exhaustive.

In a similar manner, the mobile device acting as MVM 520 is configured with keyboard 525 and touch screen 524. Upon selection of the symbol driven voting method the touch screen of the MVM is enabled for display of the various candidates and the different issues with each candidate and each issue being uniquely represented by an associated symbol. The row 521 represents the candidates and the issues in some defined order that require a choice. The row 522 represents the action representing YES choice and the row 523 represents the NO choice. The selections are executed by touching the appropriate actions associated with each symbol and selecting the symbol associated with the YES action and the symbol associated with the NO action. The foregoing is a representation for illustration purposes of a simple symbol driven voting method and is not intended to be exhaustive. In addition the features for up, down, next, back and other actions are also represented by readily understood symbols or icons.

Example 5.1: The candidate is enabled to choose a symbol to uniquely represent the candidate and register the selected symbol with the election body. By this means the voters are aware of the unique association of the candidate with a specific symbol.

Example 5.2: The party is associated with a unique symbol, such as the Democratic party being represented by a donkey symbol and the Republican party by an elephant symbol.

Example 5.3: The selection of a YES action on an issue may be enabled by the symbol of a fruit, say the mango and the fruit lemon for NO action.

Example 5.4: In a similar manner the issues on the ballot are represented by unique symbols. As an example a proposition that is for development and growth is enabled for representation as a tree in that is sprouting new leaves.

Example 5.5: The symbol driven voting menus are controlled by the election body. The symbol driven voting method is enabled on the IVM and the MVM by down loading the appropriate screens in a dynamic manner from the election servers at the desired time. The actions and selections of the voter using the symbol driven voting method by means of the IVM or the MVM are uploaded to the election servers.

Example 5.6: Alternately, the user is enabled to assign different symbols of the voter's choice to a candidate, an issue and the YES and NO actions. This option provides customization that best suits the voter. In this mode the election body need not assign any symbols. However, the voter with the help of a trusted organization configures a look up table wherein the standard textual choices are uniquely associated with customized symbols of the user's choice. The customized symbols and their one to one correspondence to a particular candidate, an issue and the YES/NO actions is uploaded to the election servers and stored for use at the appropriate time by the voter during the election and voting. As an example, the voter has the ability to assign the pig symbol to a candidate in the voter's customized election menu and the symbol angel to another candidate that is preferred. The IVM and MVM are enabled to down load the voter's symbol driven election menu when casting the votes and the voter's symbol driven selections and actions relative to a candidate or an issue are uploaded at the time of casting the ballot.

The foregoing examples illustrate the means for symbol driven electronic voting by one or more methods enabling the IVM and the MVM to dynamically perform the symbol driven voting actions by preset definition of the symbols by the election authorities and or personalization of the symbols by the voter; and using the processing power of the IVM and the MVM in a stand alone manner and or using the processing power of the local, central and or network servers; and means for secure wired or wireless communication.

Referring now to Fig. 6, in yet another embodiment of the present invention, the intelligent voting machine, IVM 610, is enabled for configuration with one or more internal features and or

external attachments for enhanced utility. The voting machine of the prior art is not configured with a microphone and speaker. The IVM 610 is configured with a microphone 612 for voice/audio input, a speaker 613 for voice/audio output, and an illustrative box 614 to represent other internal or external features and attachments such as finger print reader, retinal scan reader and others. Similarly the mobile voting machine, MVM 620 of the present invention is enabled for configuration by internal hardware/software features and or external hardware attachments to deliver enhanced functionality and electronic voting capabilities in a stand alone manner using the processing capabilities of the IVM /MVM and or in conjunction with the processing power and database capabilities of the appropriate local, central and or network servers, such capabilities being represented in the figure by the box 623 for illustrative purposes. The keyboard of the MVM is represented by 621 and the touch screen input/output/display by 622.

Additionally, the IVM and the MVM are enabled to connect by wired or wireless means to one or more of the trusted servers as appropriate, such as the trusted Language Translation Server 631, the trusted local server 632, the trusted central server 633, the trusted network server 634, the trusted GPS server 635, the trusted time keeping server 636 and the trusted escrow server 637 to achieve the desired functionality by acting alone and or in tandem. Each server is enabled with an associated storage and databases which are not shown since the concept has been shown in prior figures. The communication path, 641 between the IVM and the trusted servers is generally under the supervision and control of the election body. However, this path is isolated from the separate internal communication path between the trusted servers. The communication path between the mobile device/mobile voting machine and the trusted servers is shown as 642, which path is isolated from communication path 641 and 640 for a high level of security.

Example 6.1: Language translation of the text and voice/speech is enabled by using the processing power of the IVM/MVM by itself and or the language translation server 631 to dynamically enable the electronic voting in one or more languages without the election authorities printing ballots in multiple languages at great expense. Thus the feature of language translation is of great utility in multilingual/multi dialect countries such as India, China, USA and others to enable casting of the votes by voice inputs in one or more languages.

585 Example 6.2: Yet other embodiments of the present invention also enable the conversion of speech to text and text to speech in one or more languages with the IVM/MVM acting alone and or leveraging the processing/database capabilities of the appropriate trusted server for accurate and trusted conversions in real time. The text to speech and speech to text conversions are of great utility to vision impaired voters and also language impaired voters.

590 Example 6.3: The configuration of the IVM of the present art with a microphone and speaker provides the voter with the needed interface. In the case of the MVM, which is a mobile communication device in its original configuration, the microphone and speaker are already available.

 Example 6.4: In another embodiment of the present invention, the ability for handwriting-
595 recognition in one or more languages is enabled by using the processing power of the IVM/MVM in a stand alone manner and or in conjunction with one or more trusted servers. An example of the utility of handwriting recognition is the capability for voting for a Write-in-Candidate by simply writing on the touch screen with a pen or stylus the name of the candidate that is not on the ballot. In addition the companion utility is that of Signature recognition and authentication of the voter by
600 the trusted server.

 Example 6.5: In another embodiment of the present invention, the authentication of the voter by finger print means is enabled by using the touch screen or a special built in or external attachment for the accurate acquisition of the finger print in real time and the comparison of the acquired finger print with the finger print records in the voter database resident on the trusted
605 servers to authenticate the voter as eligible by using the processing power of the IVM/MVM and or the trusted server.

 Example 6.6: In another embodiment of the present invention, the authentication of the voter by retinal print means is enabled by using a special built in or external attachment for the accurate acquisition of the retinal print in real time and the comparison of the acquired retinal print
610 with the retinal print records in the voter database resident on the trusted servers to authenticate the voter as eligible by using the processing power of the IVM/MVM and or the trusted server.

Example 6.7: In another embodiment of the present invention, the authentication of the voter by voice print means is enabled by using a special built in microphone or external attachment for the accurate acquisition of the voice print in real time and the comparison of the acquired voice print with the voice print records in the voter database resident on the trusted servers to authenticate the voter as eligible by using the processing power of the IVM/MVM and or the trusted server.

Example 6.8: In another embodiment of the present invention, the authentication of the voter by photo/image print acquisition means is enabled by using a special built in camera or external attachment for the accurate acquisition of the photo/image print in real time and the comparison of the acquired digitized photo/image print with the photo/image print records in the voter database resident on the trusted servers to authenticate the voter as eligible by using the processing power of the IVM/MVM and or the trusted server.

Example 6.9: In yet another embodiment of the present invention the IVM and MVM units are provided with an optional Braille enabled keyboard in conjunction with the touch screen input/output/display, and the microphone/speaker features to assist the vision impaired voter to use the voice enabled voting method and or the Braille keyboard enabled voting method.

Example 6.10: In yet another embodiment of the present invention, the time stamping of the actual time at which the voter cast the ballot is enabled in conjunction with a trusted time keeping server. The trusted time keeping server, 636 of the election body is synchronized with a time keeping server maintained by a standards body which maintains the most accurate time by atomic clock and other methods. There is a need for uniformity with respect to the precise time at which the polls open and the polls close in all precincts and counties across a state and in national elections across all states. In addition the duration for which the polls stay open is also relevant. The ability for small differences in time keeping across various precincts, counties and states presents the potential for lack of uniformity and fairness in elections. This problem is solved in the present invention by having the IVM/MVM and the trusted servers synchronized or alerted such that voters have a better knowledge of the accurate time at which polls open and polls close and the elapsed duration for each precinct. Voting by the highly mobile electorate is likely across

640 various time zones while the voter is only authorized to participate in elections in a geographical area such as a designated, city, municipality, county or a state. Thus the voter on the move must have the ability to exercise the right to vote in conformance with the local regulations. The trusted servers are enabled to cause a lock out event for any attempt to vote outside the designated time based parameters.

645 Example 6.11: In yet another embodiment of the present invention, at times the physical location of the highly mobile voter is relevant. Certain countries and election authorities require by law that the voter be present physically within their geographical boundaries. In order to facilitate voting by the MVM method it is therefore necessary to authenticate the physical location of the voter at a given time. The present invention uses a trusted GPS, global positioning server that
650 works in tandem with the trusted servers of the election body. The MVM contacts the election trusted servers, said servers initiate a GPS tracking of the MVM unit and determine its location which is checked and validated by the trusted GPS server and the trusted election servers working in tandem; and further authenticated for time and place and then enabling the MVM and the voter to cast the ballot upon approval. These location determining, time determining and other
655 authentication and enabling actions are performed by the MVM device and the trusted servers acting in tandem or in a sequential manner by means of wired or wireless secure connectivity.

The present invention enables the appropriate functions for the dynamic provision of the utility desired by the voter based on one or more disabilities/infirmities/special circumstances while ensuring a high degree of authentication of the voter by using one or more of the features
660 used singly and or in combination and by leveraging the capabilities of the IVM/MVM units and the trusted servers acting singly and or in combination.

The foregoing descriptions of specific embodiments of the present invention have been presented for purposes of illustration and description. They are not intended to be exhaustive or to limit the invention to the precise forms disclosed, and it should be understood that many
665 modifications and variations are possible in light of the above teaching. The embodiments were chosen and described in order to best explain the principles of the present invention and its practical application, to thereby enable others skilled in the art to best utilize the present invention and various